ASC Scientific

ASC AUTOMATED CORE ANALYSIS SYSTEM

GENERAL DESCRIPTION

The ASC Core Transport is an automated system for moving core sections through the Bartington Instruments MS2C susceptibility sensor and collecting susceptibility data along the length of the core. The core sits on a semi-cylindrical fiberglass core boat which is pulled through the sensors using a stepping motor with power being transmitted to the boat via a cog belt. The core boat rides on two low-friction rails. The system is made up of three modular bolt-together sections which are designed to bolt to a bench or table top and can be easily broken down for transport to a field or shipboard laboratory. This modular design allows for customization to accommodate a variety of core diameters and core lengths.

Fig. 1 ASC Core Track

Core Track Overview

The "Basic" track system (for use with MS2C sensor, Figure 1) consists of three rigid, square-tubular sections: 1) a 1.8 m long aluminum "Loading" section with photodetector scanner for core initialization, 2) a central 0.5 m long nonmagnetic/nonconducting section with adjustable mounting fixture for the Bartington MS2C sensor, and 3) a 1.8 m long aluminum "Take-up" section. The core rides in a 1/4 round semi-cylindrical fiberglass boat which leaves the core unobstructed for scanning by logging instruments. This system will accommodate core sections that are up to 1.5 meter long and approximately 12 cm in diameter.

The ends of each of the track sections have standardized end-plates which allow precise alignment between the sections and easy mounting of additional track sections. Along the entire length of the track (except through the Bartington sensor coil), the sample boat is supported by and slides on two round MDS-filled nylon rails, which have a very low coefficient of friction. This design requires little or no maintenance and will avoid clogging and corrosion problems which might be encountered with a roller system.
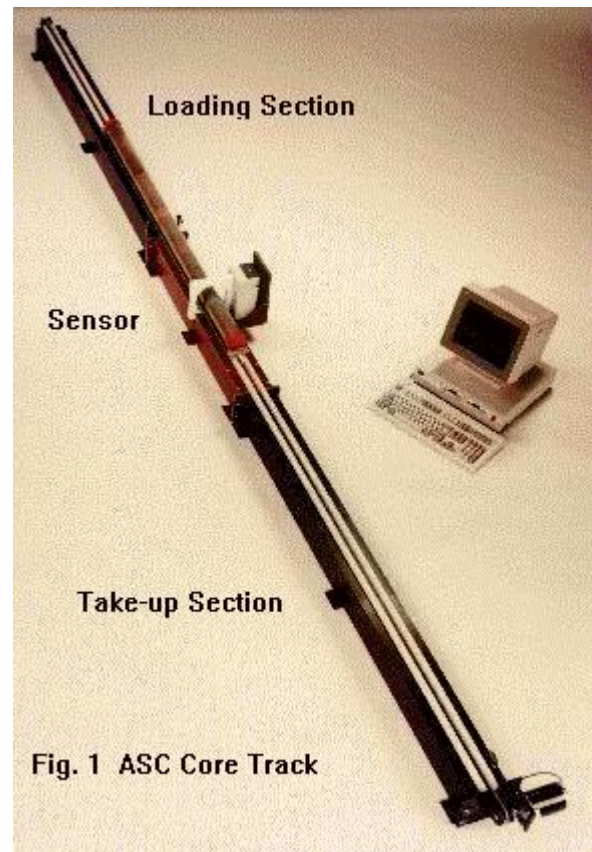
Transport Drive Hardware Overview

The transport system is driven by a stepping motor with power being transmitted to the sample boat by a Kevlar reinforced cog belt. An optical sensor is mounted on the inner end of the loading section, to initialize the sample position. Limiting switches are mounted on each extreme end of the track to stop the sample boat from being pulled into the pulleys in the event of a malfunction. The belt is attached to both ends of the boat and the sample can be moved in either direction. The belt attaches to the boat via adjustable weak links which allow for proper belt tension, but prevent damage to the sample boat and belt in the event of mechanical interference. This ability to maintain proper belt tension eliminates slippage between the drive sprocket and belt.

Motor drive hardware consists of the stepping motor and drive electronics with RS232 input for control of motor motion by supplied MAGTRAK software. Motor specifications are as follows:

- 1. Continuous Slew Rate - software default speed: 5 cm/sec

- 2. Minimum Motion Increment - 2.5 mm

- 3. Resolution - 0.2 mm

- 4. Accuracy (Overall) - Better than + 5 mm

- 5. Repeatability - Better than ± 1 mm

- 6. Motor Torque - 380 oz. in.

MAGTRAK Software Overview

MAGTRAK is a Windows based integrated software package for automated movement of the core and collection, display and storage of incremental susceptibility data. The automated movement portion of the software provides 1) initialization of the movement parameters and drive system, 2) movement of the core to its "initial" position at the optical sensor, 3) incremental movement of the core through the sensors, and 4) return of the core to its initial position.

For susceptibility data, the data collection/display/storage software collects the susceptibility versus position data, displays the data graphically while the core is being analyzed, outputs it to a line printer, and stores it in a data base file. Operator inputs for data collection include 1) parameters to set up the data file, 2) spacing between measurement positions, 3) sensitivity of susceptibility measurement, and 4) length of core section being analyzed.

Bartington MS2C Sensor

The Bartington MS2C magnetic susceptibility core scanning sensor is a coil, of fixed diameter, through which the core is run, with susceptibility measurements being taken at user-specified intervals. Spacial resolution of individual measurements is on the order of a few centimeters. Maximum sensitivity is achieved by using an MS2C sensor with a diameter that is just slightly larger than the core being analyzed. Sensitivity will drop significantly for cores that are considerably smaller than the MS2C coil diameter or for split cores. In some cases it is preferable to use MS2C sensors of different diameters for cores of different diameters.

The MS2C sensor is mounted on a nonmagnetic, nonconducting track section that is fabricated from 1.3 cm thick Micarta. This section incorporates an adjustable mounting fixture for positioning MS2C sensors of various diameters so that the sensor coil is concentric with the core sample.